KINGS NORTON SIXTH FORM

## A' Level Transition Cover Sheet

| | |
|---|---|
| **Name** | |
| **Subject** | |

**GCSE Science/Chemistry grade:**

**GCSE Maths grade:**

**Why I have chosen Chemistry A-Level:**

*Please circle how well the following skills have been demonstrated.* ***1 = Limited, 5 = Fully***

| Skills | Student | | | | | Teacher | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ability to recall answers without having to look them up** | 1 | 2 | 3 | 4 | 5 | | | | | |
| **Knowledge and Understanding** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Independent Research** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Accuracy of scientific language** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Ability to explain scientific concepts coherently** | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **Time Management** | 1 | 2 | 3 | 4 | 5 | | | | | |

**PLEASE INDICATE AS WHETHER WORK HAS BEEN COMPLETED:**

Above expected standard ☐

At expected standard ☐

Below expected standard ☐

**CONCERNS?**

Yes ☐

No ☐

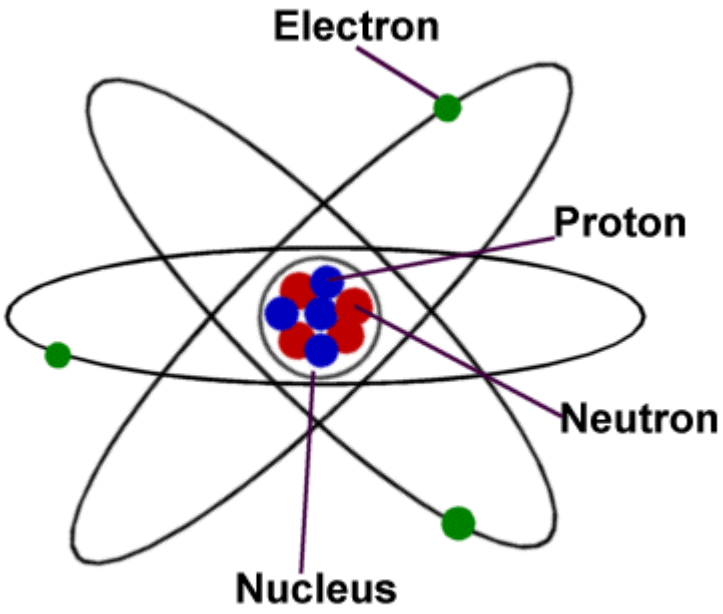
**FEEDBACK**

**Student Signature**_____ **Staff Signature**_____

KINGS NORTON
SIXTH FORM

# A Level Chemistry Transition Booklet 2021

**Name:**




**Get ready for A-level chemistry!**

**A guide to help you get ready for A-level Chemistry, including everything from topic guides to online learning courses.**

# Getting Ready For A-level Chemistry

A-level chemistry is an exciting course where you get to gain a deeper understanding of atomic structure, how chemicals interact with each other, energy changes, and how to predict if feasibility of reactions. In the lab, you will be creating new materials and will understand their properties. The course has a nice balance of practical work as well as theoretical learning. It will help you to develop your logical thinking and problem solving skills.

This booklet will guide you through the three stages to help you prepare for A-level chemistry. The 3 stages are:

**Stage 1 - Solidify GCSE Understanding Stage and Transition to Year 12 (take your understanding to the next level) - Spend approximately 5 hours on this work.**

**Stage 2— Expand your Horizons—Recommended but optional extension**

**Stage 1—Solidify GCSE Understanding -** A lot of the content of year 12 chemistry will seem familiar as it is introduced in GCSE. So, it is important to make sure your understanding of GCSE chemistry is secure.

**Transition to Year 12** A-levels are a step up from GCSEs and some students can find the transition challenging. So by preparing thoroughly now, you'll get a head start and will find the transition smoother rather than being shocked by the step up.

**Stage 2—Expand your Horizons—**In Chemistry, we often focus on the details of the subject. It is important that you still appreciate how the knowledge we are gaining fits into society. That is what makes chemistry interesting. For example, we can look into how has our understanding of chemistry shaped our history, such as understanding why the bronze age come before the iron age. We can also see how chemistry can push the boundaries, such as how NASA uses chemistry on the International Space Station. Organic chemistry also build the foundation for understanding biochemistry and medical science. So it important to fuel your interest in the subject by reading beyond the specification. We do the best in the things we are interested in. Create that interest. Science is fascinating.

**Mindset**

You are completing this work for you, not for your teachers. Don't complete the work just to get it done (that would be pointless) or to avoid trouble. Complete the work with the aim of **learning** from it. If you don't understand something, spend extra time working on it. Don't rush the work. If you are interested in something, research it further by watching a video about it or listening to a podcast. Your effort will pay off.

A-level isn't about learning facts. It is about developing critical thinking skills and deep understanding around the subject. When you are completing these tasks, think carefully and critically about your work and the questions being asked. Ensure that the answers you give are fully explained and use scientific language.

## Stage 1— Reviewing GCSE and Transitioning to Year 12

The following list comprises of fundamental chemical concepts that you have met at GCSE. Whilst we will meet these topics at A-Level again, they come up time and time again so it is important you develop your confidence with them.

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- Atomic structure, electron configuration, the formation of ions and ionic charge.
- Drawing ionic and covalent dot-cross diagrams and explaining the properties of different structures.
- The patterns in the periodic table including the reactions of 7 (halogens)
- Reactions between acids and bases/metals
- Calculations involving reacting masses and moles.
- Defining relative molecular and atomic mass and calculating the Mr/Ar for different substances
- Defining oxidation and reduction in terms of electrons and writing balanced ionic equations
- Precipitation reactions
- Equilibrium
- Energy changes (exothermic/ endothermic reactions) and rates of reactions
- Organic chemistry—Naming compounds and identifying functional groups.

**If you feel that you want more practice with any of these areas, then the following websites may be of use to you over the summer holidays so that you can begin AS chemistry with confidence. Also, you can see your chemistry teacher in September for more support.**

https://www.youtube.com/results?search_query=free+sciecne+lessons

SENECA Learning

http://www.bbc.co.uk/schools/gcsebitesize/science/

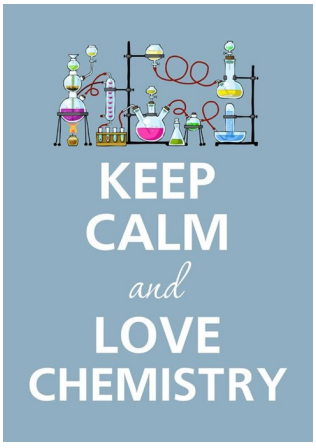
http://www.docbrown.info/page20/ocrgateway0indexC.htm

http://www.s-cool.co.uk/gcse/chemistry

http://www.my-gcsescience.com/revision/separate

http://getrevising.co.uk/resources/level/gcse/subjects/chemistry

http://www.knockhardy.org.uk/ppoints.htm




**IMPORTANT: There will be a short assessment based on these topics during one of your lessons in the first week of term. Make sure to arrive prepared for this assessment.**

## Stage 1—Activities

**Complete the following activates to further develop your understanding about the subject.**

**1.** **1 hour Research Project—**Complete a research project (last page, Appendix 9). Ensure that you keep a bibliography of the references that you use. (Vancouver Referencing would be the best method of referencing.

**2.** **Atomic Structure Transition Material**

**i—Complete the atomic structure timeline (Appendix 1—Page 9 of this document)**

**Ii— Complete the following Activities on SENECA Learning—Chemistry A Level OCR A**

**1.1.1 Atoms , 1.1.2 Isotopes, 1.1.3** Atomic Mass

**3.** **Properties Transition Material.**

**i) - Complete the Structure Terminology activity. (Appendix 2 -Page 10 of this document)**

**Ii) - Complete the Bonding Always or Usually True activity (Appendix 3—Page 11 of this document)**

**Ii) Watch the Fuse School Video Clips on Bonding**

https://www.youtube.com/user/virtualschooluk/search?query=bonding

**iii) Complete the following Activities of SENECA—**

**A. 1.7.1, 1.7.2**

**4.** **Amount of Substance Transition Material**

**i) Complete the Balancing Equations games on the link below**

https://phet.colorado.edu/en/simulation/balancing-chemical-equations

Ii) Complete the formula mass, mole calculations revision and test on BBC Bitesize

https://www.bbc.co.uk/bitesize/guides/zysk7ty/revision/1

Iii) Complete Seneca Learning

1.2.2, 1.3.1, 1.3.2, 1.3.4, 1.3.5

Iv) Amount of Substance True and False—(Appendix 5 Page 12 of this document)

**5.** **Enthalpy Transition Material**

i) Complete Seneca learning

2.5.1, 2.5.2 and 2.5.3

ii) Complete the energy in chemical reactions Worksheet

**6.** **Organic Chemistry Transition Material**

i) Complete pages 14-15 of this booklet. (Appendix 6-7)

ii) Complete SENECA 3.2.1, 3.2.2 and 3.2.3

**7.** **Fundamentals Application Questions -** Complete the questions on pages 16-19 ensuring you use accurate language and are achieving maximum marks. (Appendix 8)

## Stage 3— Expanding Horizons

## You want to be more than a grade. You want a broad understanding of the scientific world. Listening to radio shows/ pod casts/ documentaries/ reading books all contribute to this.

## Here are a few to get you started….

TED talks, '1 minute Earth' on YouTube, Infinite Monkey Cage podcast, Science stories on BBC and many more also offer up to date science discussions.

**Rough science – the Open University – 34 episodes available**

Real scientists are 'stranded' on an island and are given scientific problems to solve using only what they can find on the island.

Great fun if you like to see how science is used in solving problems.

There are six series in total

http://bit.ly/pixlchemvid1a

http://www.dailymotion.com/playlist/x2igjq_Rough-Science_rough-science-full-series/1#video=xxw6pr

or

http://bit.ly/pixlchemvid1b

https://www.youtube.com/watch?v=lUoDWAt259I

**A thread of quicksilver – The Open University**

A brilliant history of the most mysterious of elements – mercury. This program shows you how a single substance led to empires and war, as well as showing you come of the cooler properties of mercury.

http://bit.ly/pixlchemvid2

https://www.youtube.com/watch?v=t46lvTxHHTA

**10 weird and wonderful chemical reactions**

10 good demonstration reactions, can you work out the chemistry of …. any… of them?

http://bit.ly/pixlchemvid3

https://www.youtube.com/watch?v=0Bt6RPP2ANI

### Chemistry in the Movies

Dantes Peak 1997: Volcano disaster movie.

Use the link to look at the Science of acids and how this links to the movie. http://www.open.edu/openlearn/science-maths-technology/science/chemistry/dantes-peak

http://www.flickclip.com/flicks/dantespeak1.html

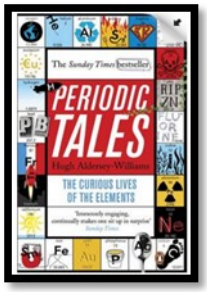
http://www.flickclip.com/flicks/dantespeak5.html

Fantastic 4 2005 &2015: Superhero movie

Michio Kaku explains the "real" science behind fantastic four http://nerdist.com/michio-kaku-explains-the-real-science-behind-fantastic-four/

http://www.flickclip.com/flicks/fantastic4.html

# Book Recommendations; You are not a grade. It is important that you can converse about science in everyday life.



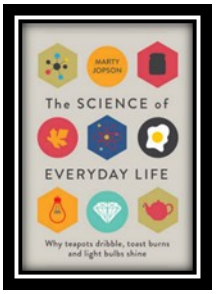

**Periodic Tales: The Curious Lives of the Elements** (Paperback) Hugh Aldersey-Williams

ISBN-10: 0141041455

http://bit.ly/pixlchembook1

This book covers the chemical elements, where they come from and how they are used.

There are loads of fascinating insights into uses for chemicals you would have never even thought about.

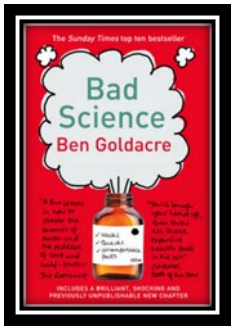



**The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine** (Hardback) Marty Jopson

ISBN-10: 1782434186

http://bit.ly/pixlchembook2

The title says it all really, lots of interesting stuff about the things around you home!



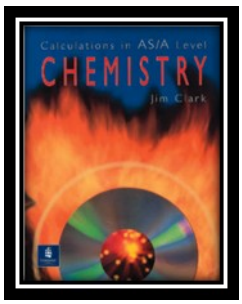

**Bad Science** (Paperback) Ben Goldacre

ISBN-10: 000728487X

http://bit.ly/pixlchembook3

Here Ben Goldacre takes apart anyone who published bad / misleading or dodgy science.

This book will make you think about everything the advertising industry tries to sell you by making it sound 'sciency'.




**Calculations in AS/A Level Chemistry** (Paperback) Jim Clark

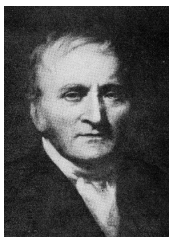
ISBN-10: 0582411270

http://bit.ly/pixlchembook4

If you struggle with the calculations side of chemistry, this is the book for you. It covers all the possible calculations you are ever likely to come across. It is brought to you by the same guy who wrote the excellent chemguide.co.uk website.

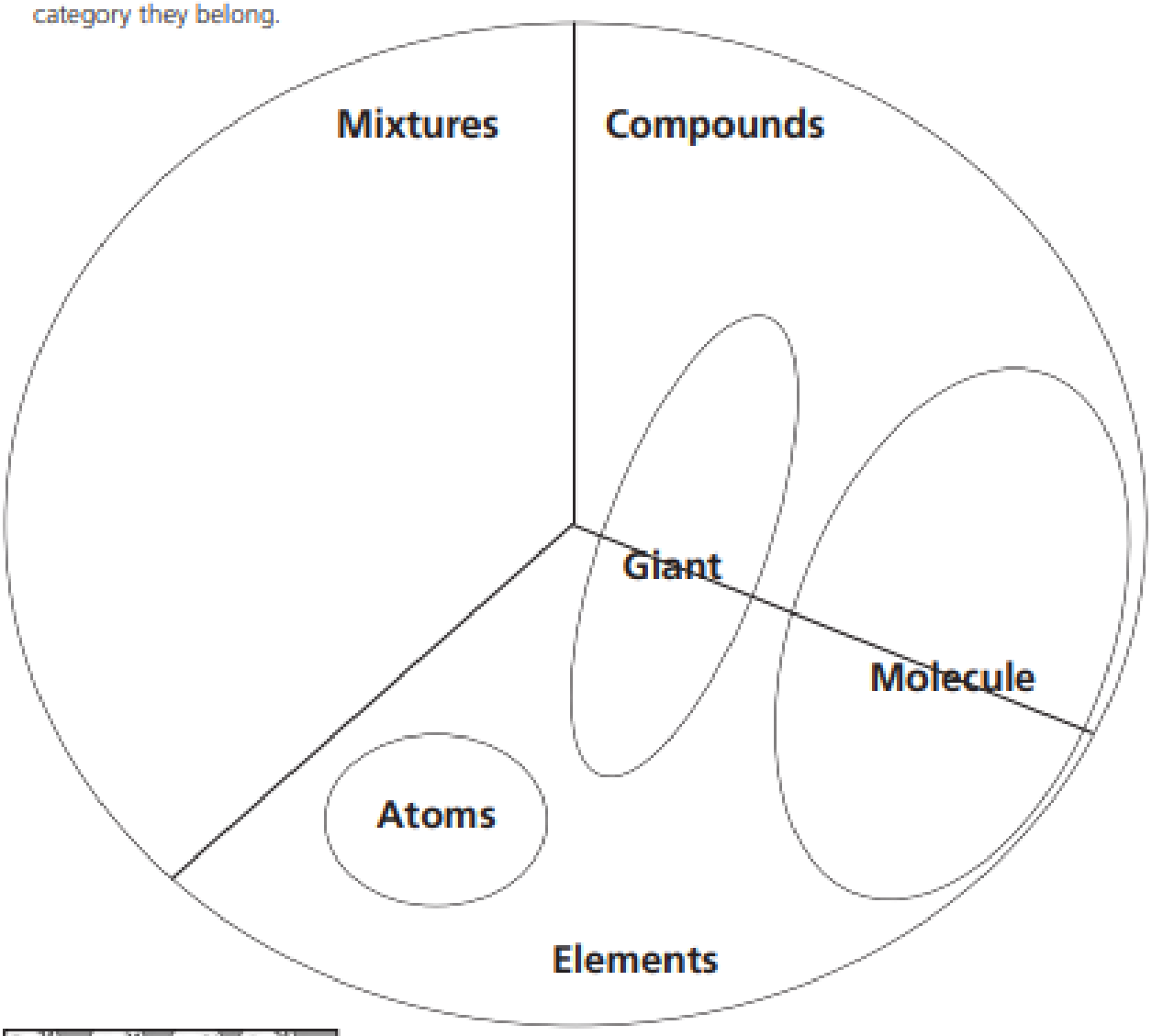

The Martian: Andy Wier (also a Matt Damon film but the book is better ) — I am halfway through this book and highly recommend it. 'Realistic' science being put to use to survive from being stranded on Mars. Every chapter contains links to A-level chemistry.

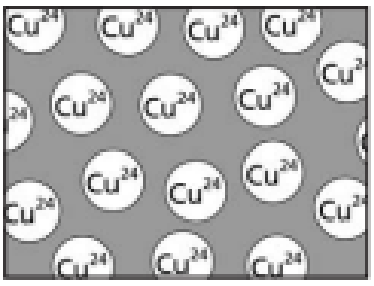
Appendix 1—Atomic Structure Timeline— Add diagrams of the atomic models proposed by the scientists below.

| **Democritus** | **John Dalton** | **J.J. Thomson** | **Ernest Rutherford** |
|---|---|---|---|
| |  |  |  |
| Everything is made up of tiny particles called atoms. The atom is indivisible. | Atoms cannot be created or destroyed. Elements are made up of only one type of atom. Atoms join together in chemical reactions. | Atoms contain tiny negatively charged particles called electrons. The rest of the atom is positive to balance out the charge, and the electrons are embedded in this like pieces of fruit in a pudding. | The positive charge and mass of the atom is concentrated in a tiny nucleus in the centre of the atom. The electrons exist randomly in the space around the nucleus. |
| | | | |

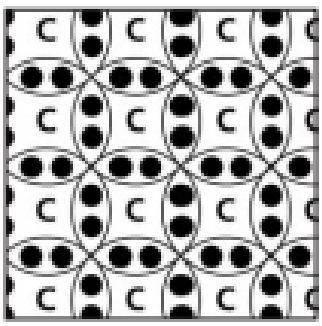
| **Niels Bohr** | **James Chadwick** | **Louis de Broglie** |
|---|---|---|
|  |  |  |
| Electrons are not randomly arranged around the atom. They exist in specific shells – like the orbits of the planets. | Some of the mass of the atom is accounted for by an uncharged particle, called a neutron. The neutron does not affect chemical properties of an element. | Just as waves can sometimes behave like particles, very small particles – like electrons – can behave like waves. |
| | | |

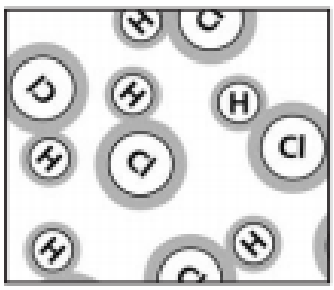
5. A student drew a Venn diagram in a different style and incorporated a category for giant structures. Write in the names of all the substances at the bottom of the page into the region of the diagram where they belong. Draw arrows from the drawings in boxes to show to which category they belong.




Iron
Sand ($SiO_2$)
Diamond
Ethanol ($C_2H_5OH$)
Sodium chloride (NaCl)
Limestone ($CaCO_3$)
Bromine ($Br_2$)
Diesel
Vegetable Oil



## Appendix 3 Bonding— Always or Usually True

Read each statement. Decide if it is always true, or usually true. Try to think of any exceptions to these rules. Be able to justify all statements.

A. The atoms of Group 2 elements have two electrons in their outer shell.

B. Noble gases do not form any types of bonds because they have full outer shells.

K. Bonding within compounds is either ionic or covalent.

L. Electrons shared between atoms (in molecular orbitals) are more stable than electrons in atomic orbitals.

C. Ionic substances have higher melting points than covalent substances.

D. Oppositely charged ions attract.

M. Electrons that are closer to the nucleus experience less shielding and are more strongly attracted than electrons further away.

N. A covalent bond is formed from a shared pair of electrons; one electron comes from each atom within the bond.

E. Delocalised electrons are more stable than electrons in fixed atomic orbitals.

F. Energy is released when ionic bonds form.

O. Compounds are more stable than elements.

P. Elements always react to form ions with noble gas electron configurations.

G. In an ionic compound, ions are combined in proportions which balance out the electrical charges.

H. Energy is needed to break covalent bonds.

Q. Ionic compounds are formed when metals react with non-metals.

R. Covalent compounds are formed when non-metals react with other non-metals.

I. Energy is required to form positive ions from atoms.

J. Energy is released when negative ions are formed from atoms.

S. Hydrogen atoms form ions by losing one electron and becoming $H^+$.

T. Within a covalent compound, all elements except hydrogen have eight electrons in their outer shells.

## Appendix 4 Amount of Substance True or False

Decide if each statement is correct, justify your reasoning.

1. The total number and type of atoms present are the same at the start and end of a reaction.

2. The amount of substance, measured in moles, is the same at the start and end of a reaction.

3. The total mass of reactants is equal to the total mass of products for any reaction.

4. The total volume of gas is the same at the start and the end of a reaction.

5. The amount in moles is proportional to the number of particles for that substance.

6. One mole of methane molecules ($CH_4$) contains 1/5 mole of carbon atoms and 4/5 mole of hydrogen atoms.

7. One mole of methane molecules ($CH_4$) contains 1 mole of carbon atoms and 4 moles of hydrogen atoms.

8. 100 $cm^3$ of methane gas contains the same number of molecules as 100 $cm^3$ hydrogen gas at room temperature and pressure.

9. 100 $cm^3$ of methane gas at room temperature and pressure has the same mass as 100 $cm^3$ of hydrogen gas under the same conditions.

10. If 0.1 mol of magnesium atoms reacts with a solution containing 0.1 mol of hydrochloric acid, 0.1 mol of hydrogen molecules will be produced. (Hint – you may need to look up or work out the balanced equation for this reaction.)

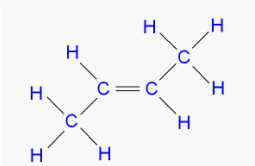
## Appendix 5 Organic Chemistry

1. Complete the table below. LEARN how to name the first 12 alkanes.

| Name | Molecular Formula | Structural |
|---|---|---|
| Methane | | |
| Ethane | | |
| _____ane | $C_3H$__ | |
| _____ane | $C_4H$__ | |
| | $C_5H_{12}$ | |
| | $C_6H_{14}$ | |
| | $C_7H_{16}$ | |
| | $C_8H_{18}$ | |
| | $C_9H_{20}$ | |
| | $C_{10}H_{22}$ | |
| | $C_{11}H_{24}$ | |
| | $C_{12}H_{26}$ | |

## Appendix 6 Organic Chemistry—2 Functional

2. Complete the table below. LEARN what each of these functional groups are and how they are represented.

| Name of functional group | Example | Uses |
|---|---|---|
| Alkene<br><br>C=C | But-2-ene<br>  | Alkenes are used to make plastics in addition polymerisation.<br>They are used to make alcohols, and haloalkenes.<br>They are used a s a chemical feedstock for many reactions. |
| Alcohol<br>-OH | | |
| Carboxylic acid | | |
| Haloalkane | | |
| Ester | | |
| Aldehyde | | |
| ketone | | |
| Addition polymer | | |
| Polyester (condensation polymer) | | |

# Appendix 7 The Fundamentals Application Questions

## The Atom

Draw and label the sub-atomic structure of the atom

In the element sodium, Na, it has a mass number of 23 and a proton number of 11. Calculate the number of electrons/ protons / neutrons in this element.

Explain why the atom has no overall charge

Explain why sodium atoms will form ions with a +1 charge. Use a half equation to support your answer

## Chemical formula

Identify the number of different elements, total number of atoms and the Mr (RFM) of these formulae

$Mg(OH)_2$

$(NH_4)_2SO_4$

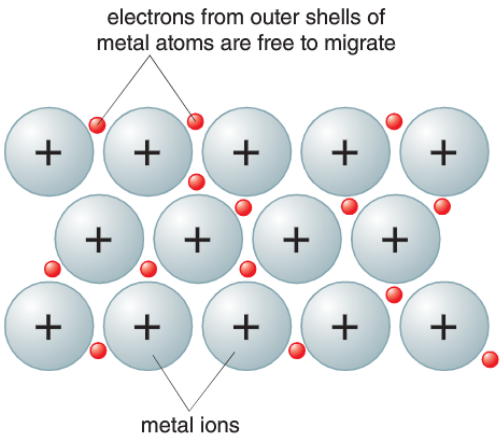
$Ca(NO_3)_2$

Work out the chemical formula if these ions form ionic compounds

1. $K^+$ and $Cl^-$
2. $O^{2-}$ and $Mg^{2+}$
3. $Na^+$ and $CO_3^{2-}$
4. $Al^{3+}$ and $OH^-$

## Bonding: ionic, covalent, metallic and intermolecular

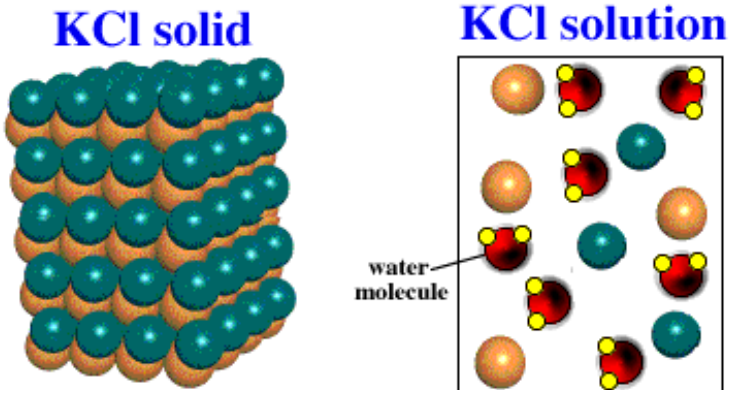
Using the diagram below to help, explain why metals




1. conduct heat/ electricity

2. have a high melting point

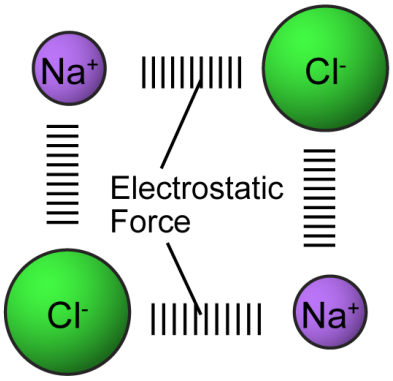
3. Name the attraction between the electrons and positive ions (not a 'metallic' bond).




## Ionic compounds

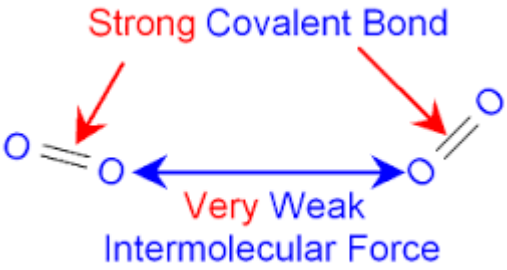
Define an ionic bond.

Explain what is meant by a 'giant ionic lattice'.




Explain why solid ionic compounds don't conduct, but can when in solution or molten?

Explain why have ionic compounds high melting points.




## Covalent compounds

Define a covalent bond.

Explain why simple covalent compounds have low boiling points.

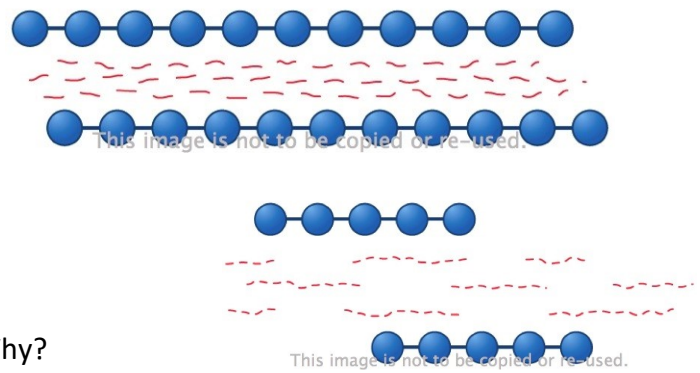
Explain why covalent compounds can't conduct electricity?

## Intermolecular bonds

Define an intermolecular bond.

If an atom or molecular is bigger how does this affect the strength of the intermolecular bond?

How will this impact the molecules boiling point? Why?



# Appendix 9—Research Project

Use your online research skills to see if you can find out as much about the topic as you can. Remember it you are a prospective A level chemist, you should aim to extend **your** knowledge. Remember to reference your work appropriately and DO NOT copy and paste.

**You can make a 1-page summary for one topic from below.**

### Why is copper sulfate blue?

Copper compounds like many of the transition metal compounds have got vivid and distinctive colours – but why?

### The hole in the ozone layer

Why did we get a hole in the ozone layer? What chemicals were responsible for it? Why were we producing so many of these chemicals? What is the chemistry behind the ozone destruction?